

TR-398 Issue 2

WiFi Performance Test Plan

Sun Sep 19 13:26:19 PDT 2021



Test Setup Information	
Device Under Test	Anonymous Enterprise AX AP
Estimated Run Time	34 m
Actual Run Time	36.335 m

Objective

The TR-398 Issue 2 WiFi Performance test plan by the Broadband forum provides a comprehensive set of tests to qualify the performance of WiFi access points (APs) designed for residential and small office environments. Radio performance, Throughput, Connection Stability, Airtime Fairness, AP Co-existence, Mu_MIMO Performance, Spatial Consistency and Long-term Stability are some of the test areas covered in this test plan. The test plan is designed for service providers deploying in home WiFi APs to qualify the APs in the lab before deployment and for equipment makers to test during the development of the APs. Candela Technologies offers a fully automated TR-398 Issue 2 test system. The user can select from the list of 11 tests available in the GUI and all selected tests are run fully automated at one click of a button. Measurements are made and compared to the specified PASS/FAIL criteria in the TR-398 Issue 2 test plan and this report will show the summary PASS/FAIL results followed more detailed results for each test.

Summary Results

Test	Result	Candela Score	Elapsed	Info
Calibrate 802.11AX Zero Attenuation RSSI	Skipped	0	0	
Calibrate 802.11AC Zero Attenuation RSSI	Skipped	0	0	
6.1.1 Receiver Sensitivity Test	Skipped	0	0	
6.2.1 Maximum Connection Test (32-STA)	Skipped	0	0	
6.2.2 Maximum TCP Throughput Test	Skipped	0	0	
6.2.3 Airtime Fairness Test	Skipped	0	0	
Issue-3 Airtime Fairness Test	2.4Ghz FAIL 5Ghz PASS	91	35.791 m	AC 5Ghz passed 9 / 9 AX 5Ghz passed 9 / 9 N 2.4Ghz passed 9 / 9 AX 2.4Ghz passed 6 / 9
6.2.4 Dual-Band Throughput Test	Skipped	0	0	
6.2.5 Bidirectional UDP Throughput Test	Skipped	0	0	
6.3.1 Range Versus Rate Test	Skipped	0	0	
6.3.2 Spatial Consistency Test	Skipped	0	0	
6.3.3 AX Peak Performance TCP Throughput Test	Skipped	0	0	
6.4.1 Multiple STAs Performance Test	Skipped	0	0	
6.4.2 Multiple Association / Disassociation Stability Test	Skipped	0	0	
6.4.3 Downlink MU-MIMO Performance Test	Skipped	0	0	
6.5.2 AP Coexistence Test	Skipped	0	0	
6.5.1 Long Term Stability Test	Skipped	0	0	

Issue-3 Airtime Fairness Test

Summary

Airtime Fairness Test intends to verify the capability of Wi-Fi device to ensure the fairness of airtime usage. This test uses two stations at a time, with one station running in optimum configuration. The second station varies between optimum configuration, weaker signal, and legacy mode configurations. In each setting, TCP traffic is used to determine maximum capacity of each station running by itself. Then, UDP traffic is created on STA1 to run at 75% of the TCP throughput and UDP traffic is created on the second station at 50% of the TCP throughput for that station. This overdrives the AP and causes it to drop frames. The pass/fail criteria is that each station gets at least 45% of the TCP throughput when both stations are running the prescribed UDP traffic.

Test Procedure

1. Establish the setup using default configuration for the 802.11n 2.4 GHz frequency band with $N_{ss} = 2$ operating mode for STA1 and STA2. Use or configure a STA3 to only use 802.11b/g.
2. Associate STA1 and STA2 with DUT. Establish the LAN connection and wait for 10 seconds.
3. Measure the achievable downlink TCP throughput through STA1, using a test time of 120 seconds. Record this value as `STA1_Throughput_Max_DL_1`.
4. Measure the achievable downlink TCP throughput through STA2, using a test time of 120 seconds. Record this value as `STA2_Throughput_Max_DL_1`.
5. Configure the downlink UDP traffic streams to use a downlink data rate set to 75% of `STA1_Throughput_Max_DL_1` for STA1 and 50% of `STA2_Throughput_Max_DL_1` for STA2.
6. Simultaneously run the two UDP traffic streams for 120 seconds, recording the throughput for each stream. Record these values as `STA1_Throughput_1` and `STA2_Throughput_1` respectively.
7. Move STA2 to a medium distance to the DUT (equivalent to 38 dB@2.4GHz and 25 dB @5GHz attenuation between DUT and STA2, plus 2M distance calibrated attenuation). Wait for 10 seconds.
8. Measure the achievable downlink TCP throughput through STA2, using a test time of 120 seconds. Record this value as `STA2_Throughput_Max_DL_2`.
9. Configure the downlink UDP traffic streams to use a downlink data rate set to 75% of `STA1_Throughput_Max_DL_1` for STA1 and 50% of `STA2_Throughput_Max_DL_2` for STA2.
10. Simultaneously run the two UDP traffic streams for 120 seconds, recording the throughput for each stream. Record these values as `STA1_Throughput_2` and `STA2_Throughput_2` respectively.
11. Disassociate STA2 with the DUT. Replace STA 2 with STA 3, configured for the specified Wi-Fi operating mode, and remove the attenuation. Establish the Wi-Fi connection between STA3 and DUT and wait for 10 seconds.
12. Measure the achievable downlink TCP throughput through STA3, using a test time of 120 seconds. Record this value as `STA3_Throughput_Max_DL_3`.
13. Configure the downlink UDP traffic streams to use a downlink data rate set to 75% of `STA1_Throughput_Max_DL_1` for STA1 and 50% of `STA3_Throughput_Max_DL_3` for STA3.
14. Simultaneously run the two UDP traffic streams for 120 seconds, recording the throughput for each stream. Record these values as `STA1_Throughput_3` and `STA2_Throughput_3` respectively.
15. Set the DUT to operating mode to 802.11ac 5 GHz frequency band with $N_{ss} = 2$. Replace or reconfigure STA3 with a STA that uses only 802.11a. Repeat steps 2 through 14.
16. Set the DUT to operating mode to 802.11ax 2.4 GHz frequency band with $N_{ss} = 2$. Replace or reconfigure STA3 with a STA that uses only 802.11n. Repeat steps 2 through 14.
17. Set the DUT to operating mode 802.11ax 5 GHz frequency band with $N_{ss} = 2$. Replace or reconfigure STA3 with a STA that uses only 802.11ac. Repeat steps 2 through 14.

Pass/Fail Criteria

1. For each UDP measurement, the throughput shall be at least 45% of the TCP Throughput Max speeds reported on the station being tested. This ensures that the AP properly limits the over-driven STA1 connection and gives the other station a fair amount of airtime.

To verify over-all throughput while ensuring airtime fairness, the throughput of the DUT SHALL meet the requirements below.

1. For the test in 802.11n 2.4 GHz frequency band with $N_{ss} = 2$:
 1. The summation of `STA1_Throughput_1` and `STA2_Throughput_1` SHALL be larger than 100 Mbps.
 2. The summation of `STA1_Throughput_2` and `STA2_Throughput_2` SHALL be larger than 100 Mbps.
 3. The summation of `STA1_Throughput_3` and `STA3_Throughput_3` SHALL be larger than 60 Mbps.
2. For the test in 802.11ac 5 GHz frequency band:
 1. The summation of `STA1_Throughput_1` and `STA2_Throughput_1` SHALL be larger than 650 Mbps.
 2. The summation of `STA1_Throughput_2` and `STA2_Throughput_2` SHALL be larger than 550 Mbps.
 3. The summation of `STA1_Throughput_3` and `STA3_Throughput_3` SHALL be larger than 335 Mbps.
3. For the test in 802.11ax 2.4 GHz frequency band:
 1. The summation of `STA1_Throughput_1` and `STA2_Throughput_1` SHALL be larger than 190 Mbps.
 2. The summation of `STA1_Throughput_2` and `STA2_Throughput_2` SHALL be larger than 130 Mbps.
 3. The summation of `STA1_Throughput_3` and `STA3_Throughput_3` SHALL be larger than 95 Mbps.
4. For the test in 802.11ax 5 GHz frequency band:

1. The summation of STA1_throughput_1 and STA2_throughput_1 SHALL be larger than 900 Mbps.
2. The summation of STA1_throughput_2 and STA2_throughput_2 SHALL be larger than 750 Mbps.
3. The summation of STA1_throughput_3 and STA3_throughput_3 SHALL be larger than 600 Mbps.

Candela Score

The Candela Score for Airtime Fairness Test is calculated as the percentage sub-tests that passed the pass/fail criteria.

Issue-3 Airtime Fairness Test Results

Type	Result	Value	P/F Value	Notes
Configuration NOTE	INFO			Traffic duration is set to: 60s, default is 120s
AX 2.4Ghz STA1 Near	INFO			Reported TCP throughput: 220.36 Mbps
AX 2.4Ghz STA2 Near	INFO			Reported TCP throughput: 220.66 Mbps
AX 2.4Ghz STA2 Medium	INFO			Reported TCP throughput: 125.68 Mbps
AX 2.4Ghz Near: STA1+2 Total Throughput	PASS	218	190	STA1: Tput 108.25 Mbps Req: 165.27 Drop: 34.04% STA-RSSI: -31 Rx-Rate: 286.7M Tx-Rate: 58.5M STA2: Tput 110.17 Req: 110.33 Mbps Drop: 0% STA-RSSI: -32 Rx-Rate: 286.7M Tx-Rate: 286.7M
AX 2.4Ghz Near: STA1 ATF Throughput	PASS	108.25	99.16	
AX 2.4Ghz Near: STA2 ATF Throughput	PASS	110.17	99.30	
AX 2.4Ghz Medium: STA1+2 Total Throughput	FAIL	113	130	STA1: Tput 111.45 Req: 165.27 Mbps Drop: 32.32% STA-RSSI: -31 Rx-Rate: 286.7M Tx-Rate: 286.7M STA2: Tput 1.90 Req: 62.84 Mbps Drop: 96.99% STA-RSSI: -58 Rx-Rate: 149.7M Tx-Rate: 286.7M
AX 2.4Ghz Medium: STA1 ATF Throughput	PASS	111.45	99.16	
AX 2.4Ghz Medium: STA2 ATF Throughput	FAIL	1.90	56.56	
AX 2.4Ghz STA3 Legacy	INFO			Reported TCP throughput: 55.69 Mbps
AX 2.4Ghz Legacy: STA1+3 Total Throughput	PASS	110	95	STA1: Tput 82.56 Req: 165.27 Mbps Drop: 49.75% STA-RSSI: -31 Rx-Rate: 286.7M Tx-Rate: 286.7M STA3: Tput 27.81 Req: 27.85 Mbps Drop: 0% STA-RSSI: -30 Rx-Rate: 72.2M Tx-Rate: 72.2M
AX 2.4Ghz Legacy: STA1 ATF Throughput	FAIL	82.56	99.16	
AX 2.4Ghz Legacy: STA3 ATF Throughput	PASS	27.81	25.06	
AX 5Ghz STA1 Near	INFO			Reported TCP throughput: 944.24 Mbps
AX 5Ghz STA2 Near	INFO			Reported TCP throughput: 944.52 Mbps
AX 5Ghz STA2 Medium	INFO			Reported TCP throughput: 676.83 Mbps
AX 5Ghz Near: STA1+2 Total Throughput	PASS	1,007	900	STA1: Tput 536.38 Mbps Req: 708.18 Drop: 24.12% STA-RSSI: -39 Rx-Rate: 1.201G Tx-Rate: 245M STA2: Tput 470.25 Req: 472.26 Mbps Drop: 0.29% STA-RSSI: -42 Rx-Rate: 1.201G Tx-Rate: 720.6M
AX 5Ghz Near: STA1 ATF Throughput	PASS	536.38	424.91	
AX 5Ghz Near: STA2 ATF Throughput	PASS	470.25	425.03	
AX 5Ghz Medium: STA1+2 Total Throughput	PASS	882	750	STA1: Tput 546.30 Req: 708.18 Mbps Drop: 22.72% STA-RSSI: -39 Rx-Rate: 1.201G Tx-Rate: 245M STA2: Tput 335.81 Req: 338.41 Mbps Drop: 0.59% STA-RSSI: -61 Rx-Rate: 960.7M Tx-Rate: 1.081G
AX 5Ghz Medium: STA1 ATF Throughput	PASS	546.30	424.91	
AX 5Ghz Medium: STA2 ATF Throughput	PASS	335.81	304.57	
AX 5Ghz STA3 Legacy	INFO			Reported TCP throughput: 348.30 Mbps
AX 5Ghz Legacy: STA1+3 Total Throughput	PASS	707	600	STA1: Tput 533.31 Req: 708.18 Mbps Drop: 24.50% STA-RSSI: -40 Rx-Rate: 1.201G Tx-Rate: 245M STA3: Tput 173.76 Req: 174.15 Mbps Drop: 0.06% STA-RSSI: -37 Rx-Rate: 866.7M Tx-Rate: 433.3M
AX 5Ghz Legacy: STA1 ATF Throughput	PASS	533.31	424.91	
AX 5Ghz Legacy: STA3 ATF Throughput	PASS	173.76	156.73	
N 2.4Ghz STA1 Near	INFO			Reported TCP throughput: 114.47 Mbps
N 2.4Ghz STA2 Near	INFO			Reported TCP throughput: 112.69 Mbps
N 2.4Ghz STA2 Medium	INFO			Reported TCP throughput: 113.91 Mbps
N 2.4Ghz Near: STA1+2 Total Throughput	PASS	123	100	STA1: Tput 66.36 Mbps Req: 85.85 Drop: 22.35% STA-RSSI: -20 Rx-Rate: 144.4M Tx-Rate: 195M STA2: Tput 56.18 Req: 56.35 Mbps Drop: 0.14% STA-RSSI: -23 Rx-Rate: 144.4M Tx-Rate: 216.7M

N 2.4Ghz Near: STA1 ATF Throughput	PASS	66.36	51.51	
N 2.4Ghz Near: STA2 ATF Throughput	PASS	56.18	50.71	
N 2.4Ghz Medium: STA1+2 Total Throughput	PASS	122	100	STA1: Tput 65.28 Req: 85.85 Mbps Drop: 23.61% STA-RSSI: -22 Rx-Rate: 144.4M Tx-Rate: 216.7M STA2: Tput 56.86 Req: 56.96 Mbps Drop: 0% STA-RSSI: -59 Rx-Rate: 144.4M Tx-Rate: 195M
N 2.4Ghz Medium: STA1 ATF Throughput	PASS	65.28	51.51	
N 2.4Ghz Medium: STA2 ATF Throughput	PASS	56.86	51.26	
N 2.4Ghz STA3 Legacy	INFO			Reported TCP throughput: 29.58 Mbps
N 2.4Ghz Legacy: STA1+3 Total Throughput	PASS	86	60	STA1: Tput 71.50 Req: 85.85 Mbps Drop: 16.35% STA-RSSI: -22 Rx-Rate: 144.4M Tx-Rate: 216.7M STA3: Tput 14.77 Req: 14.79 Mbps Drop: 0% STA-RSSI: -28 Rx-Rate: 54M Tx-Rate: 36M
N 2.4Ghz Legacy: STA1 ATF Throughput	PASS	71.50	51.51	
N 2.4Ghz Legacy: STA3 ATF Throughput	PASS	14.77	13.31	
AC 5Ghz STA1 Near	INFO			Reported TCP throughput: 694.24 Mbps
AC 5Ghz STA2 Near	INFO			Reported TCP throughput: 689.96 Mbps
AC 5Ghz STA2 Medium	INFO			Reported TCP throughput: 447.71 Mbps
AC 5Ghz Near: STA1+2 Total Throughput	PASS	750	650	STA1: Tput 406.62 Mbps Req: 520.68 Drop: 21.74% STA-RSSI: -38 Rx-Rate: 866.7M Tx-Rate: 866.7M STA2: Tput 343.32 Req: 344.98 Mbps Drop: 0.27% STA-RSSI: -34 Rx-Rate: 866.7M Tx-Rate: 866.7M
AC 5Ghz Near: STA1 ATF Throughput	PASS	406.62	312.41	
AC 5Ghz Near: STA2 ATF Throughput	PASS	343.32	310.48	
AC 5Ghz Medium: STA1+2 Total Throughput	PASS	649	550	STA1: Tput 425.78 Req: 520.68 Mbps Drop: 18.11% STA-RSSI: -34 Rx-Rate: 866.7M Tx-Rate: 866.7M STA2: Tput 222.96 Req: 223.86 Mbps Drop: 0.27% STA-RSSI: -57 Rx-Rate: 585.1M Tx-Rate: 650M
AC 5Ghz Medium: STA1 ATF Throughput	PASS	425.78	312.41	
AC 5Ghz Medium: STA2 ATF Throughput	PASS	222.96	201.47	
AC 5Ghz STA3 Legacy	INFO			Reported TCP throughput: 30.17 Mbps
AC 5Ghz Legacy: STA1+3 Total Throughput	PASS	432	335	STA1: Tput 416.85 Req: 520.68 Mbps Drop: 19.72% STA-RSSI: -34 Rx-Rate: 866.7M Tx-Rate: 866.7M STA3: Tput 15.06 Req: 15.09 Mbps Drop: 0% STA-RSSI: -38 Rx-Rate: 54M Tx-Rate: 54M
AC 5Ghz Legacy: STA1 ATF Throughput	PASS	416.85	312.41	
AC 5Ghz Legacy: STA3 ATF Throughput	PASS	15.06	13.58	

ATF: Near Distance STA1+STA2 Snapshot AX 2.4Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx- Fail %	Tx-Link- Rate	Rx-Link- Rate	Mode	Channel	Last CX- Time(ms)	RSSI (dBm)	AP	IP	MAC
1.2.16 wlan0	19.413 Kbps	72.748 Mbps	0	58.5 Mbps	229.4 Mbps	802.11bgn- AX	6	348	-30	4C:B1:CD:18:E8:E8	172.18.101.134	d8:f8:83:35:db:e9
1.2.17 wlan4	288.443 Kbps	118.596 Mbps	0	286.7 Mbps	229.4 Mbps	802.11bgn- AX	6	174	-34	4C:B1:CD:18:E8:E8	172.18.101.135	a4:6b:b6:3d:61:4d

Port	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC
1.2.2 eth2	241.405 Mbps	222.65 Kbps	2.5 Gbps	172.18.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-2.wlan0--1.0.0-A	19.98 Kbps	109.772 Mbps	102	555371	84	88	0	34.117
cv_udp-2.2-2.wlan0--1.0.0-B	165.275 Mbps	20.079 Kbps	842966	102	4	88	6	0
cv_udp-2.2-2.wlan4--1.0.0-A	19.946 Kbps	110.321 Mbps	102	564403	8	10	0	0
cv_udp-2.2-2.wlan4--1.0.0-B	110.88 Mbps	19.976 Kbps	555044	100	2	10	4	0

ATF: Medium Distance STA1+STA2 Snapshot AX 2.4Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx- Fail %	Tx-Link- Rate	Rx-Link- Rate	Mode	Channel	Last CX- Time(ms)	RSSI (dBm)	AP	IP	MAC
------	--------------	-------------	------------------	------------------	------------------	------	---------	----------------------	---------------	----	----	-----

1.2.16 wlan0	26.632 Kbps	123.609 Mbps	0	286.7 Mbps	286.7 Mbps	802.11bgn- AX	6	348	-31	4C:B1:CD:18:E8:E8	172.18.101.134	d8:f8:83:35:db:e9
1.2.17 wlan4	24.312 Kbps	42.357 Mbps	0	286.7 Mbps	149.7 Mbps	802.11bgn- AX	6	174	-58	4C:B1:CD:18:E8:E8	172.18.101.135	a4:6b:b6:3d:61:4d

Port	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC
1.2.2 eth2	235.276 Mbps	51.085 Kbps	2.5 Gbps	172.18.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-2.wlan0--1.0.0-A	20.079 Kbps	111.861 Mbps	102	570404	2	3	0	31.808
cv_udp-2.2-2.wlan0--1.0.0-B	165.7 Mbps	20.007 Kbps	836468	101	1	3	2	0
cv_udp-2.2-2.wlan4--1.0.0-A	20.045 Kbps	1.874 Mbps	102	9730	5.034	5.037	0	96.931
cv_udp-2.2-2.wlan4--1.0.0-B	63.149 Mbps	19.919 Kbps	317028	100	3	5.037	2	0

ATF: Legacy STA1+STA3 Snapshot AX 2.4Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.2.16 wlan0	28.336 Kbps	80.625 Mbps	0	286.7 Mbps	286.7 Mbps	802.11bgn- AX	6	348	-31	4C:B1:CD:18:E8:E8	172.18.101.134	d8:f8:83:35:db:e9
1.1.10 sta03500	253.801 Kbps	33.663 Mbps	0.511	72.2 Mbps	72.2 Mbps	802.11bgn	6	94	-30	4C:B1:CD:18:E8:E8	172.18.105.24	00:0a:52:06:02:a7

Port	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC
1.2.2 eth2	173.972 Mbps	325.358 Kbps	2.5 Gbps	172.18.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-2.wlan0--1.0.0-A	19.94 Kbps	83.176 Mbps	102	424198	111	117	0	49.756
cv_udp-2.2-2.wlan0--1.0.0-B	165.274 Mbps	20.055 Kbps	844281	102	6	117	6	0
cv_udp-2.2-1.sta03500--1.0.0-A	19.976 Kbps	27.844 Mbps	102	142385	4	9	0	0
cv_udp-2.2-1.sta03500--1.0.0-B	27.857 Mbps	19.723 Kbps	141661	101	5	9	5	0

ATF: Near Distance STA1+STA2 Snapshot AX 5Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.2.16 wlan0	17.003 Kbps	363.504 Mbps	0.001	245 Mbps	1.201 Gbps	802.11an- AX	36	198	-38	4C:B1:CD:18:E8:EC	172.18.101.134	d8:f8:83:35:db:e9
1.2.17 wlan4	385.118 Kbps	545.583 Mbps	0.002	720.6 Mbps	1.201 Gbps	802.11an- AX	36	145	-42	4C:B1:CD:18:E8:EC	172.18.101.135	a4:6b:b6:3d:61:4d

Port	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC
1.2.2 eth2	1.12 Gbps	177.299 Kbps	2.5 Gbps	172.18.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-2.wlan0--1.0.0-A	20.047 Kbps	536.852 Mbps	102	2752324	27	35	0	23.168
cv_udp-2.2-2.wlan0--1.0.0-B	711.415 Mbps	20.057 Kbps	3582269	101	8	35	8	0
cv_udp-2.2-2.wlan4--1.0.0-A	19.968 Kbps	470.963 Mbps	102	2414681	4	12	0	0
cv_udp-2.2-2.wlan4--1.0.0-B	474.053 Mbps	20.056 Kbps	2387174	101	8	12	9	0

ATF: Medium Distance STA1+STA2 Snapshot AX 5Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.2.16 wlan0	21.608 Kbps	523.813 Mbps	0.001	245 Mbps	1.201 Gbps	802.11an- AX	36	198	-39	4C:B1:CD:18:E8:EC	172.18.101.134	d8:f8:83:35:db:e9
1.2.17 wlan4	22.516 Kbps	374.172 Mbps	0.002	1080.6 Mbps	960.7 Mbps	802.11an- AX	36	145	-61	4C:B1:CD:18:E8:EC	172.18.101.135	a4:6b:b6:3d:61:4d

Port	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC
1.2.2 eth2					

1.2.2 eth2	1.033 Gbps	44.808 Kbps	2.5 Gbps	172.18.0.1	9c:69:b4:61:c6:12
------------	------------	-------------	----------	------------	-------------------

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-2.wlan0--1.0.0-A	20.023 Kbps	546.993 Mbps	102	2794306	30	37	0	21.969
cv_udp-2.2-2.wlan0--1.0.0-B	708.32 Mbps	19.977 Kbps	3581035	101	7	37	6	0
cv_udp-2.2-2.wlan4--1.0.0-A	20.153 Kbps	336.309 Mbps	102	1717837	18	65	0	0
cv_udp-2.2-2.wlan4--1.0.0-B	339.42 Mbps	19.988 Kbps	1716585	101	47	65	33	0

ATF: Legacy STA1+STA3 Snapshot AX 5Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.2.16 wlan0	22.708 Kbps	526.213 Mbps	0.001	245 Mbps	1.201 Gbps	802.11an-AX	36	198	-40	4C:B1:CD:18:E8:EC	172.18.101.134	d8:f8:83:35:db:e9
1.1.10 sta03000	21.762 Kbps	177.991 Mbps	0.488	433.3 Mbps	866.7 Mbps	802.11an-AC	36	32	-37	4C:B1:CD:18:E8:EC	172.18.104.208	00:0a:52:06:35:7c

Port	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC
1.2.2 eth2	905.293 Mbps	45.94 Kbps	2.5 Gbps	172.18.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-2.wlan0--1.0.0-A	19.987 Kbps	533.766 Mbps	102	2744017	31	43	0	24.483
cv_udp-2.2-2.wlan0--1.0.0-B	708.19 Mbps	20.036 Kbps	3633644	102	12	43	9	0
cv_udp-2.2-1.sta03000--1.0.0-A	19.898 Kbps	174.051 Mbps	102	887968	3	10	0	0
cv_udp-2.2-1.sta03000--1.0.0-B	174.148 Mbps	19.858 Kbps	890471	102	7	10	6	0

ATF: Near Distance STA1+STA2 Snapshot N 2.4Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.1.10 sta01500	27.266 Kbps	49.931 Mbps	0.818	195 Mbps	144.4 Mbps	802.11bgn	6	132	-22	4C:B1:CD:18:E8:E8	172.18.105.21	00:0a:52:06:2a:a7
1.1.11 sta02000	642.26 Kbps	73.952 Mbps	0.38	216.7 Mbps	144.4 Mbps	802.11bgn	6	131	-25	4C:B1:CD:18:E8:E8	172.18.104.152	00:0a:52:06:38:a6

Port	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC
1.2.2 eth2	134.334 Mbps	1.077 Mbps	2.5 Gbps	172.18.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta01500--1.0.0-A	19.97 Kbps	66.365 Mbps	102	341070	186	194	0	21.797
cv_udp-2.2-1.sta01500--1.0.0-B	85.816 Mbps	19.676 Kbps	436133	100	8	194	7	0
cv_udp-2.2-1.sta02000--1.0.0-A	19.929 Kbps	56.271 Mbps	102	288427	8	16	0	0
cv_udp-2.2-1.sta02000--1.0.0-B	56.266 Mbps	19.503 Kbps	285606	99	8	16	5	0.980

ATF: Medium Distance STA1+STA2 Snapshot N 2.4Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC
1.1.10 sta01500	27.768 Kbps	62.958 Mbps	0.82	216.7 Mbps	144.4 Mbps	802.11bgn	6	132	-22	4C:B1:CD:18:E8:E8	172.18.105.21	00:0a:52:06:2a:a7
1.1.11 sta02000	19.205 Kbps	54.3 Mbps	0.384	195 Mbps	144.4 Mbps	802.11bgn	6	131	-59	4C:B1:CD:18:E8:E8	172.18.104.152	00:0a:52:06:38:a6

Port	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC
1.2.2 eth2	134.463 Mbps	49.77 Kbps	2.5 Gbps	172.18.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta01500--1.0.0-A	19.834 Kbps	65.346 Mbps	102	334216	194	202	0	23.796
cv_udp-2.2-1.sta01500--1.0.0-B	85.851 Mbps	19.852 Kbps	438582	101	8	202	6	0.980
cv_udp-2.2-1.sta02000--1.0.0-A	19.933 Kbps	56.957 Mbps	102	291932	9	16	0	0

cv_udp-2.2-1.sta02000--1.0.0-B	56.957 Mbps	19.952 Kbps	291712	102	7	16	7	0
--------------------------------	-------------	-------------	--------	-----	---	----	---	---

ATF: Legacy STA1+STA3 Snapshot N 2.4Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC	
1.1.10 sta01500	23.167 Kbps	40.066 Mbps	0.825	216.7 Mbps	144.4 Mbps	802.11bgn	6	132	-22	4C:B1:CD:18:E8:E8	172.18.105.21	00:0a:52:06:2a:a7	
1.1.12 sta02500	30.627 Kbps	15.437 Mbps	4.201	36 Mbps	54 Mbps	802.11bg	6	101	-28	4C:B1:CD:18:E8:E8	172.18.105.177	00:0a:52:06:09:1a	
1.2.2 eth2	79.545 Mbps	148.602 Kbps	2.5 Gbps	172.18.0.1	9c:69:b4:61:c6:12	MAC		IP		AP		Port	

Endpoint	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta01500--1.0.0-A	19.874 Kbps	71.623 Mbps	102	366938	169	174	0	16.534	
cv_udp-2.2-1.sta01500--1.0.0-B	85.851 Mbps	19.89 Kbps	439624	101	5	174	3	0.980	
cv_udp-2.2-1.sta02500--1.0.0-A	19.906 Kbps	14.784 Mbps	102	75579	9	16	1	0	
cv_udp-2.2-1.sta02500--1.0.0-B	14.852 Mbps	20.037 Kbps	74864	101	7	16	5	0	

ATF: Near Distance STA1+STA2 Snapshot AC 5Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC	
1.1.10 sta01000	17.592 Kbps	288.152 Mbps	1.392	866.7 Mbps	866.7 Mbps	802.11an-AC	36	1,049	-38	4C:B1:CD:18:E8:EC	172.18.105.75	00:0a:52:06:1a:7c	
1.1.11 sta01500	2.457 Mbps	390.22 Mbps	8.085	866.7 Mbps	866.7 Mbps	802.11an-AC	36	33	-36	4C:B1:CD:18:E8:EC	172.18.105.142	00:0a:52:06:22:1d	
1.2.2 eth2	763.605 Mbps	2.444 Mbps	2.5 Gbps	172.18.0.1	9c:69:b4:61:c6:12	MAC		IP		AP		Port	

Endpoint	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta01000--1.0.0-A	19.903 Kbps	406.953 Mbps	103	2110669	31	39	0	19.816	
cv_udp-2.2-1.sta01000--1.0.0-B	520.682 Mbps	19.865 Kbps	2703797	102	8	39	5	0.971	
cv_udp-2.2-1.sta01500--1.0.0-A	20.048 Kbps	344.063 Mbps	103	1784023	1	9	0	0	
cv_udp-2.2-1.sta01500--1.0.0-B	344.989 Mbps	19.671 Kbps	1758491	101	8	9	5	0	

ATF: Medium Distance STA1+STA2 Snapshot AC 5Ghz

Port	Tx-Bps 1m	RxBps 1m	Tx-Fail %	Tx-Link-Rate	Rx-Link-Rate	Mode	Channel	Last CX-Time(ms)	RSSI (dBm)	AP	IP	MAC	
1.1.10 sta01000	22.419 Kbps	404.731 Mbps	1.393	866.7 Mbps	866.7 Mbps	802.11an-AC	36	1,049	-39	4C:B1:CD:18:E8:EC	172.18.105.75	00:0a:52:06:1a:7c	
1.1.11 sta01500	21.195 Kbps	256.375 Mbps	8.085	650 Mbps	585.1 Mbps	802.11an-AC	36	33	-57	4C:B1:CD:18:E8:EC	172.18.105.142	00:0a:52:06:22:1d	
1.2.2 eth2	765.589 Mbps	44.306 Kbps	2.5 Gbps	172.18.0.1	9c:69:b4:61:c6:12	MAC		IP		AP		Port	

Endpoint	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta01000--1.0.0-A	19.979 Kbps	426.137 Mbps	102	2182059	29	36	0	17.126	
cv_udp-2.2-1.sta01000--1.0.0-B	521.676 Mbps	20.011 Kbps	2632977	101	7	36	5	0	
cv_udp-2.2-1.sta01500--1.0.0-A	19.942 Kbps	223.26 Mbps	102	1142957	1	11	0	0	
cv_udp-2.2-1.sta01500--1.0.0-B	224.582 Mbps	19.828 Kbps	1135667	101	10	11	8	0	

ATF: Legacy STA1+STA3 Snapshot AC 5Ghz

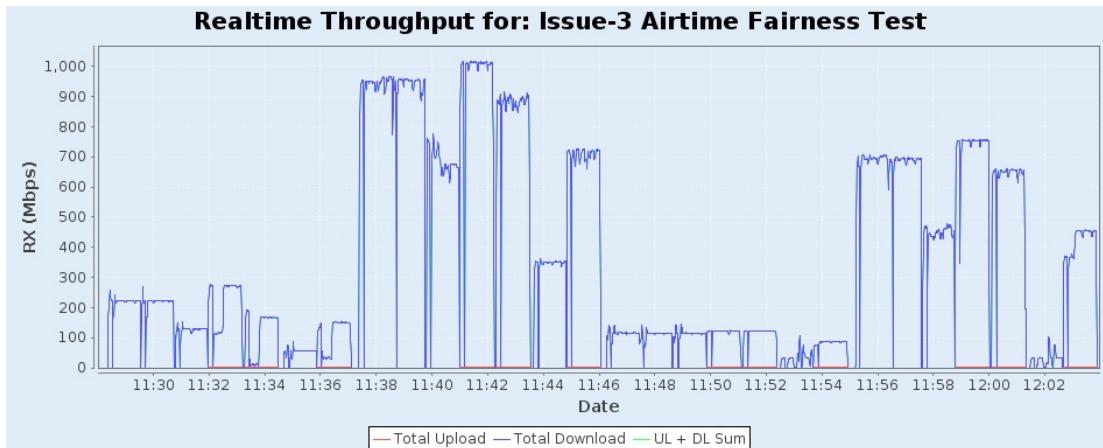
Tx-Bps	RxBps	Tx-Fail	Tx-Link-	Rx-Link-			Last CX-	RSSI			
--------	-------	---------	----------	----------	--	--	----------	------	--	--	--

Port	1m	1m	%	Rate	Rate	Mode	Channel	Time(ms)	(dBm)	AP	IP	MAC
1.1.10 sta01000	28.288 Kbps	415.906 Mbps	1.394	866.7 Mbps	866.7 Mbps	802.11an- AC	36	1,049	-39	4C:B1:CD:18:E8:EC	172.18.105.75	00:0a:52:06:1a:7c
1.1.12 sta02000	49.241 Kbps	16.217 Mbps	4.67	24 Mbps	54 Mbps	802.11a	36	307	-40	4C:B1:CD:18:E8:EC	172.18.105.156	00:0a:52:06:1a:8f

Port	Tx-Bps 1m	Rx-Bps 1m	Link-Rate	IP	MAC
1.2.2 eth2	446.928 Mbps	106.397 Kbps	2.5 Gbps	172.18.0.1	9c:69:b4:61:c6:12

Endpoint	Tx-Bps 1m	Rx-Bps 1m	TxPkts	RxPkts	RX Latency(ms)	Round-Trip Latency(ms)	Jitter	Rx Packet Loss %
cv_udp-2.2-1.sta01000--1.0.0-A	19.932 Kbps	418.957 Mbps	102	2148911	22	28	0	18.663
cv_udp-2.2-1.sta01000--1.0.0-B	521.229 Mbps	19.926 Kbps	2641969	101	6	28	5	0
cv_udp-2.2-1.sta02000--1.0.0-A	19.838 Kbps	15.086 Mbps	102	77063	6	45	0	0
cv_udp-2.2-1.sta02000--1.0.0-B	15.069 Mbps	19.904 Kbps	76460	101	39	45	3	0

TR-398 Issue 2



[Key Performance Indicators CSV](#)

Test configuration and LANforge software version	
Auto-Helper	true
Skip 2.4Ghz Tests	false
Skip 5Ghz Tests	false
Duration-120	30
Duration-60	20
Channel 2Ghz	6
Channel 5Ghz	36
Extra Download Path-loss	0
TX Power	20
Multi-Conn	5
ToS	0
Upstream Port	1.2.2 eth2 Firmware: 0x80000aef, 1.1876.0 Resource: ct523c-3b89
Turn-Table Chamber	TR-398
Configured 2m 2.4Ghz RSSI	-26
Configured 2m 5Ghz RSSI	-30
Opposite-Speed:	20000
Randomize Offered Load	false
Max-CX Offered Load:	1000000
Max-CX 2Ghz N rate:	2000000
Max-CX 2Ghz AX rate:	3000000

Max-CX 5Ghz AC rate:	8000000
Max-CX 5Ghz AX rate:	10000000
Throughput N 2Ghz rate:	100000000
Throughput AC 5Ghz rate:	560000000
Throughput AX 2Ghz rate:	200000000
Throughput AX 5Ghz rate:	720000000
Throughput AX 2Ghz rate:	300000000
Throughput AX 2x2 5Ghz rate:	1100000000
Throughput AX 4x4 5Ghz rate:	1100000000
ATF Max NSS:	2
ATF Attenuation:	0
Max allowed packet loss%:	0.05
Assoc/Disassoc Traffic %:	99
Requested Rx-Sens Speed	65%
RxSens Rotation Degrees:	180
RxSens Start Step:	4
Attenuation Adjustment	0
Stop RX-Sens at pass	false
Pause on zero throughput	false
Use Virtual AX Stations	false
Auto-Calibrate Interferer	false
Interferer AC 5G-80Mhz:	195.00 Mbps
Interferer AC 5G-40Mhz:	90.00 Mbps
Interferer AC 2.4G-20Mhz:	32.00 Mbps
Interferer AX 5G-80Mhz:	195.00 Mbps
Interferer AX 5G-40Mhz:	90.00 Mbps
Interferer AX 2.4G-20Mhz:	32.00 Mbps
Spatial Rotation Degrees:	30
Test Retries:	0
Stability Duration-180	180
Stability Max-Iterations	16
Stability UDP Duration	15 m
Calibration Mode:	4
Calibration NSS:	1
WiFi Radio 0	1.1.2 wiphy0 Resource: ct523c-3b29
WiFi Radio 1	1.1.3 wiphy1 Resource: ct523c-3b29
WiFi Radio 2	1.1.4 wiphy2 Resource: ct523c-3b29
WiFi Radio 3	1.1.5 wiphy3 Resource: ct523c-3b29
WiFi Radio 4	1.1.6 wiphy4 Resource: ct523c-3b29
WiFi Radio 5	1.1.7 wiphy5 Resource: ct523c-3b29
WiFi AX Radio 0	1.2.wiphy0 Firmware: release/core62::5ecbd6da Resource: ct523c-3b89
WiFi AX Radio 1	1.2.wiphy1 Firmware: release/core62::5ecbd6da Resource: ct523c-3b89
WiFi AX Radio 2	1.2.wiphy2 Firmware: release/core62::5ecbd6da Resource: ct523c-3b89
WiFi AX Radio 3	1.2.wiphy3 Firmware: release/core62::5ecbd6da Resource: ct523c-3b89
WiFi AX Radio 4	1.2.wiphy4 Firmware: release/core62::5ecbd6da Resource: ct523c-3b89
WiFi AX Radio 5	1.2.wiphy5 Firmware: release/core62::5ecbd6da Resource: ct523c-3b89
WiFi AX Radio 6	1.2.wiphy6 Firmware: release/core62::5ecbd6da Resource: ct523c-3b89
WiFi AX Radio 7	1.2.wiphy7 Firmware: release/core62::5ecbd6da Resource: ct523c-3b89
WiFi AX Radio 8	1.2.wiphy8 Firmware: release/core62::5ecbd6da Resource: ct523c-3b89
WiFi AX Radio 9	1.2.wiphy9 Firmware: release/core62::5ecbd6da Resource: ct523c-3b89
WiFi AX Radio 10	1.2.wiphy10 Firmware: release/core62::5ecbd6da Resource: ct523c-3b89
WiFi AX Radio 11	1.2.wiphy11 Firmware: release/core62::5ecbd6da Resource: ct523c-3b89

WiFi AX Radio 12	1.3.wiphy0 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 13	1.3.wiphy5 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 14	1.3.wiphy10 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 15	1.3.wiphy15 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 16	1.3.wiphy1 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 17	1.3.wiphy6 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 18	1.3.wiphy11 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 19	1.3.wiphy16 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 20	1.3.wiphy2 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 21	1.3.wiphy7 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 22	1.3.wiphy12 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 23	1.3.wiphy17 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 24	1.3.wiphy3 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 25	1.3.wiphy8 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 26	1.3.wiphy13 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 27	1.3.wiphy18 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 28	1.3.wiphy4 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 29	1.3.wiphy9 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 30	1.3.wiphy14 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
WiFi AX Radio 31	1.3.wiphy19 Firmware: release/core62::5ecbd6da Resource: ct523c-de7c
Attenuator 0	rssi-0-2.4Ghz: -28 rssi-0-5Ghz: -35 atten: 1.1.3094.0
Attenuator 1	rssi-0-2.4Ghz: -28 rssi-0-5Ghz: -35 atten: 1.1.3094.1
Attenuator 2	rssi-0-2.4Ghz: -28 rssi-0-5Ghz: -35 atten: 1.1.3094.2
Attenuator 3	rssi-0-2.4Ghz: -28 rssi-0-5Ghz: -35 atten: 1.1.3094.3
Attenuator 4	rssi-0-2.4Ghz: -22 rssi-0-5Ghz: -33 atten: 1.1.3102.0
Attenuator 5	rssi-0-2.4Ghz: -22 rssi-0-5Ghz: -33 atten: 1.1.3102.1
Attenuator 6	rssi-0-2.4Ghz: -22 rssi-0-5Ghz: -33 atten: 1.1.3099.0
Attenuator 7	rssi-0-2.4Ghz: -22 rssi-0-5Ghz: -33 atten: 1.1.3099.1
Attenuator 8	rssi-0-2.4Ghz: -25 rssi-0-5Ghz: -39 atten: 1.1.3102.2
Attenuator 9	rssi-0-2.4Ghz: -25 rssi-0-5Ghz: -39 atten: 1.1.3102.3
Attenuator 10	rssi-0-2.4Ghz: -25 rssi-0-5Ghz: -39 atten:
Attenuator 11	rssi-0-2.4Ghz: -25 rssi-0-5Ghz: -39 atten:
AX Attenuator 0	AX rssi-0-2.4Ghz: -29 rssi-0-5Ghz: -35 atten: 1.1.3100.3
AX Attenuator 1	AX rssi-0-2.4Ghz: -29 rssi-0-5Ghz: -35 atten: 1.1.3100.2
AX Attenuator 2	AX rssi-0-2.4Ghz: -29 rssi-0-5Ghz: -35 atten: NA
AX Attenuator 3	AX rssi-0-2.4Ghz: -29 rssi-0-5Ghz: -35 atten: NA
AX Attenuator 4	AX rssi-0-2.4Ghz: -23 rssi-0-5Ghz: -32 atten: 1.1.3100.1
AX Attenuator 5	AX rssi-0-2.4Ghz: -23 rssi-0-5Ghz: -32 atten: 1.1.3100.0
AX Attenuator 6	AX rssi-0-2.4Ghz: -23 rssi-0-5Ghz: -32 atten:
AX Attenuator 7	AX rssi-0-2.4Ghz: -23 rssi-0-5Ghz: -32 atten:
AX Attenuator 8	AX rssi-0-2.4Ghz: -26 rssi-0-5Ghz: -39 atten: 1.1.3099.3
AX Attenuator 9	AX rssi-0-2.4Ghz: -26 rssi-0-5Ghz: -39 atten: 1.1.3099.2
AX Attenuator 10	AX rssi-0-2.4Ghz: -26 rssi-0-5Ghz: -39 atten:
AX Attenuator 11	AX rssi-0-2.4Ghz: -26 rssi-0-5Ghz: -39 atten:
Show Events	true
Build Date	Sun 19 Sep 2021 11:24:47 AM PDT
Git Version	cafe0b41675aeacd5056fc681a4b2fa8f27708e9

[CSV Data](#)

[META Information for TR-398 Issue 2](#)

Generated by Candela Technologies LANforge network testing tool.
www.candela-tech.com

